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Rekindling Imagination in Dementia Care with the Resonant Interface Rocking Chair

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Abstract

In this paper we present the Resonant Interface Rocking Chair, interactive furniture designed for sparking the imagination of residents in dementia care. We show how the chair, sitting at the intersection of slow technology, reminiscence research and elder care, creates an environment that encourages storytelling, interaction and conversation between care home residents, family and staff. Our aim is to develop the *resonant home*, envisioning a future care environment that draws upon current research into resonant user interfaces to create an environment that is alive with subtle, playful and engaging memories and emotions.

Author Keywords

Older adults; Dementia Care; Slow Technology; Peripheral Interaction; Calm Computing; Care Homes.

ACM Classification Keywords

H.5.2. Information interfaces and presentation: Interaction Styles; User-centred Design; Auditory Feedback.

Introduction

Care homes for the elderly can be un-stimulating environments for their residents due to factors including: loss of personal belongings when moving into the home; a reduction in personal freedom and

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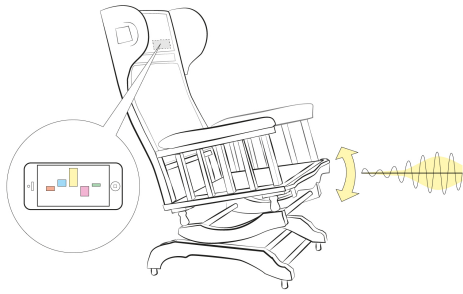


Figure 1 Resonant Interface Rocking Chair with speakers in both sides of the headrest and iPod behind the headrest. Showing the chair resonating at a particular frequency.

mobility; and a focus on physical health at the expense of mental wellbeing. From our work on the Tangible Memories project [17] over the last twenty-one months, we have identified several factors that make solving the problem of creating engaging interaction in dementia care challenging and have designed the Resonant Interface Rocking Chair (Figure 1) in response to them:

Motivation for Interaction. Designing devices that the elderly residents will independently pick up and use. Factors involve lack of understanding to the benefits of using a new device, the natural appeal of it as well as the amount of effort required to learn how to use it and if they need others to help them in its use. How can an interface be designed that captures the motivation and attention of the residents whilst being an intuitive interaction that residents can use independently?

Self-Confidence in use. There is often a lack of confidence that prevents many residents from exploring the use of a new technology. How can self-confidence be built through the use of the new device?

Lack of Novelty. As a system is embedded in the home it may become familiar to the residents to the point where it drops out of attention. How can devices be made for long-term engagement?

We propose that by applying *resonance* as an interface design metaphor yields novel solutions to these challenges. In this paper we refer to resonance both in context to our own work developing 'Resonant Bits' [7], which focuses on the resonant motion as an interaction technique, and prior research into 'Resonant Tangible Interfaces' which explores 'the ability of a product to

evoke positive images, memories, and emotions, and to encourage a prolonged, subtle, or stimulating effect beyond the initial impact' [10]. The reason we believe resonant interaction is particularly applicable to the design challenges of interfaces in dementia care is that through workshops and informal testing we have found the style of interaction it encourages is fluid, explorative, playful, open-ended and surprising. An example this is found in the Harmonic Tuner [6], a resonant music player app, which was the precursor to the Resonant Interface Rocking Chair design. The Harmonic Tuner app allows music tracks to be selected by rocking the phone to match the motion of a virtual pendulum representing each track. As the user matches a particular track's frequency, the amplitude of the pendulum increases, which is accordingly mapped to the track's volume. The resulting interaction was found to be simple yet engaging.

The concept of the *Resonant Home* builds upon research into reminiscence technology, which aims to imbue objects and everyday devices with stories, memories and audio recordings. Systems that link memories and objects include the 'Living Memory Box' [15], designed to record, preserve and playback memories in a variety of digital media, CIRCA which provides a variety of interactive multimedia to 'stimulate long-term memory to prompt verbal and non-verbal communication' [8] through to devices such as the 'Music Memory Box' [13] which allows the playback of music attached to personal possessions. Combining these numerous reminiscence technologies and linking them together may result in 'The Internet of Old Things' as an 'augmented memory system' [3], which goes some way towards establishing a similar goal as that of our vision of the *Resonant Home* albeit

we propose an approach that is more closely aligned with the goals of Peripheral Interaction [2] and Slow Technology [9].

Ethnographic Work and Design Probes

Over the course of twenty-one months and across three care homes we have undertaken a number of different approaches to investigation from ethnography, through to running activities and design interventions. These have mainly taken the form of organising regular sessions for groups and individuals, lasting typically 1-2 hours, although a few substantially longer sessions have taken place.

Our collaborators 'Alive!' [1], a charity who have pioneered the use of iPads in care homes, run activity sessions for older people in over 350 care homes and day centres across the South and South West of England. They trained the Tangible Memories research team in how to work alongside the residents of the care homes and have worked closely with us on the design of our workshops and also helped guide the design process.

Below, we outline three of our designs that were fundamental to the development of the Resonant Interface Rocking Chair. Essential design insights were gained from these explorations, and we include them here to give a fuller picture of where the guiding questions (motivation for interaction, self-confidence and lack of novelty) have originated.

The *Story Panel Chairs* probe used existing sound panels in one of the homes that allowed the playback of audio recordings. We found that the panels had fallen out of use partially due to the difficulty in updating the

recorded material. The panels each contained facts about the Queen read out by the care home manager. We replaced the sounds with stories that some of the residents made during a trip we organised to the city museum stores. To accompany the sound recordings the panels were fitted with large photos of the residents while out on the trip (Figure 2). We found that the panels were used more after the change as a focus for talking about the project and the residents role in it, with the sense of ownership being an important driving factor in bringing the residents back to the recordings.

As an alternative to using sound, we also trialled the use of a 'VR chair', set to show 360° panoramic views from landmarks around Bristol. The images were captured using a photo-stitching app, allowing local scene to be requested and captured for use in subsequent sessions. It was discovered that our initial expectations of the VR-chair being a solitary experience was quickly overturned as the session turned into a very sociable gathering. Residents took turns using the system, whilst onlookers gathered around and talked about the experience. It was found that using the VR glasses as a 'periscope' rather than using straps was beneficial as participants could quickly come in and out of viewing the scene (Figure 2). We also experimented with the addition of binaural sound-recordings made in the same location as the panoramas, however it was found that the headphones cut the residents off too much for maintaining conversation.

The *TopoTiles* [5] were designed as part of an investigation into location and storytelling and were a result of activities based on storytelling around maps, postcards and walking. Inspired by methods of geographical and spatial storytelling such as the mobile



Figure 2 Story panels (left), a precursor to the Resonant Interface Rocking Chair. VR chair (right).



Figure 3 TopoTiles. Miniature stylised landscapes used to unlock and play field recordings through resonant interaction.

phone storytelling system “I’m your body” [12], we wanted to create a device that echoed the environment and could be used as a satisfying tactile aid for storytelling. Each TopoTile is a miniature landscape that represents a Bristol landmark in a stylised manner that leaves it open to interpretation, for instance the Cabot Tower tile has also been used to represent a Japanese temples or a castle on a hill (Figure 3). Each TopoTile is made from a solid cast block of multi-coloured resin, with a magnet and radio frequency identification chip embedded inside. When a tile is brought into the vicinity of a mobile phone running the accompanying TopoTile app, sound recordings and stories are released, controlled by the frequency with which the TopoTile is moved back and forth. It was found that the ambiguity of the interfaces allowed for open discussion and for sparking of conversation. It is planned that the TopoTiles will act as an interface for both capturing and curating sounds for use in the Resonant Interface Rocking Chair.

Resonant Interface Rocking Chair

The Resonant Interface Rocking Chair was designed to address the three challenges we have identified through our ethnographic and design probe work. Firstly, *motivation*, getting residents to pick up and use the new technology is difficult for a wide number of reasons including fear of failure (“*I’ll break it!*”). Secondly, the lack of self-confidence in use (“*I wouldn’t know what to do!*”). Thirdly the lack of novelty, where an interface fades into the background of daily life due to familiarity. Although there are many other further challenges in designing interfaces for engaging activity in dementia care, we found that for us these are the fundamental three stumbling blocks for adoption of a new interface.

Our response to the issues of motivation and lack of self-confidence was by choosing the chair as an interface. The chair fits seamlessly into the care home environment and has the benefit of redundancy – even if the technology fails, it still works as a comfortable chair. A rocking chair was chosen over a static chair as the rocking motion has been shown to be beneficial to health, a study showing improved balance, muscle tone, emotional well-being, and a reduction in the number of requests for medication to treat aches and pains in the majority of older people they tested [18].

One aspect of using the chair that we considered was the potential health and safety issues, something we have initially addressed by moving from a standard rocker to a ‘glider’, looking at how the chair can be fixed to the floor and also the addition of a locking mechanism to prevent movement when sitting down and standing up. In a discussion with staff, the care home manager spoke about the importance of ‘positive risk-taking’ in order to enhance quality of life as far as possible. She talked about how care should not just be about keeping people with dementia physically safe, but equally, must incorporate the personal, social and emotional needs of the individual. The manager also emphasized how much emotion is involved for the families, friends and relatives visiting their loved ones with dementia, and how much it is necessary for everyone to cherish the present, while the present moment is often all that remains for those with advanced memory-loss.

Rocking Chair Interaction

The operation of the rocking chair is very simple, particularly when it is only utilising one ‘resonant bit’ for interaction. The chair remains silent when at rest

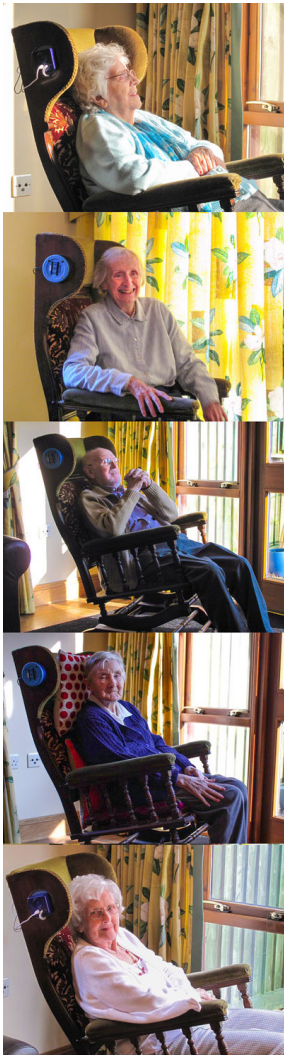


Figure 4 The Resonant Interface Rocking Chair in use by residents during testing.

until a resident sits on it. The amount of motion of the chair is directly proportional to the sound track's volume; if someone rocks the chair vigorously the volume increases accordingly. A new song is selected at random each time the chair comes to a rest, which is independent of someone sitting on the chair or not. Currently the sound files that are loaded on to the resonant rocking chair app are chosen manually and have included poems, nature recordings, classical music and pop songs. However inspiration can be taken from systems such as PENSIEVE [14] that automates the choice of media through mining social media, a technique that may be more feasible in the future when more new residents entering the care home will have had an active participation in social media. The addition of extra 'resonant bit' elements as described in the development of the Harmonic Tuner [6], allows for a more complex, yet still simple to operate interface. For instance, rocking at different speeds may bring forth different styles of music, or can be set to map the speed of rocking to musical tempo.

Technical Implementation

The Resonant Interface Rocking Chair runs on a mobile device (iPod Touch) that is placed in the headrest. Two speakers are placed in either side of the headrest, giving stereo playback. Sound files can be loaded to the app via iTunes, simplifying the method of updating new sounds and encouraging regular changing of the playlist.

The application uses the mobile device's accelerometers to determine the amount that the chair is being rocked. The value is passed through a low-pass filter so that it takes time (approximately 10 seconds) to both build up to full volume and this also fades the music out over

the same time period when rocking is stopped. This value was carefully adjusted so that the user feels they remain in control of the chair but the change in the music's volume changes smoothly.

User testing

The chair was tested firstly in an intensive day-long workshop where eight residents in the home had the chance to try it out with assistance (Figure 4) and secondly over a longer period of a fortnight where it was left in situ for the residents to use in their own time if they wished. A wide range of ages was represented, from mid 70s through to early 90s, with only one male resident participating. On the test day, we anticipated that one of our key concerns would be the challenge and safety of residents getting in and out of the rocking chair. In fact this did not appear to present a problem for many of the resident testers, and where assistance was required, staff were close at hand to help.

One resident, a former pilot, spent some time to begin with exploring the surface of the chair through touch, commenting that it was like being in the cockpit of an aeroplane. Then, listening carefully to the different sounds emitting from the speakers embedded in the rocking chair's headrests, she identified a woodpecker and an owl's call among the chorus of birdsong, and she even cooed back to the owl in reply. As she heard the rhythmic sound of someone walking on snow, she lifted her legs up and down in time, keeping pace with the footsteps, whilst describing a vivid story to us about what was happening in her imagination: "*The farmer's on his way...*".



Figure 5. Resonant Rocking Chair installed in Memory Parlour.

The chair also was popular with the staff, all of who wanted to sit and try it out themselves. They were also encouraging about the effects the chair had on the residents. A resident who proceeded to sing right the way through “rock-a-bye baby” moved one member of staff to tears. This was a significant moment as the resident did not normally converse directly with staff at all, let alone sing.

Not all residents seemed to recognise that a rocking motion triggered the sound, or necessarily to register that sound was playing at all, but this did not seem to matter. At some level, all the residents appeared to benefit from and engage with the experience, even if it was simply to enjoy the new position overlooking the garden, the novelty of the chair itself, or perhaps the number of people spending time with them in a more focused way than would usually be possible on a daily basis for care staff.

Recently the project has designed, developed and installed a ‘Memory Parlour’ inside one of the participating care homes, with the Resonant Rocking chair being installed as a permanent feature (Figure 5). In addition to the chair a ‘Story Creator’ app [16] has been developed for recording and sharing residents memories, possibly providing an avenue to explore for providing content for the chair. We anticipate this permanent installation will provide longitudinal data for further development of the resonant home.

The Resonant Home

Our vision of the *Resonant Home* is a calming environment that provides gentle stimulus through music, memories and spoken word, subtly augmenting the care home through a series of peripheral and

liminal interactions based on oscillatory movement and motion. We believe that this approach offers a fundamentally different stance to the drive towards smart homes, as resonance aims for a much more emergent form of playful interaction, and that although it may a potentially lower fidelity of control has the possibility of offering long term enjoyment and engagement to a wide variety of users.

In addition to the interactive rocking chair, we are planning to develop a handheld object-based version of the app, by embedding an iPhone into a tactile object, such as a foam ball, that could be used for armchair exercises for older people in care homes. Continuous movement of the object would similarly trigger sounds, music or poems, combining light muscle activity with a spontaneous audio experience.

Conclusion

In this paper we have presented the Resonant Interface Rocking Chair, which takes a step towards creating the *Resonant Home*, a care environment that promotes social interaction amongst residents, family, staff and visitors. Developing the project across the care homes has resulted in an overwhelmingly positive response from the participants as is summed up by one of the residents: “*I think when you look back - and it's been lovely doing this project because it has renewed one's memories of the past and you go away, I don't know about you, but I go away and I think: "That's great, I didn't have such a bad life after all".*”

Acknowledgements

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